Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Implicit and Hybrid Techniques for the Simulation of High-Density Electrode Plasmas for Pulsed Power Accelerator Design DALE WELCH, DAVID ROSE, CARSTEN THOMA, CHRIS MOSTROM, ERIC WATSON, KEVIN LIND, Voss Scientific — Recent advances in implicit and hybrid techniques have demonstrated that finite-difference-time-domain particle-in-cell (PIC) simulation codes can effectively model volumetric and electrode plasmas at high density. Plasmas generation and evolution can seriously affect the efficiency of pulsed power delivery as well as microwave sources and gas switch performance. Energy-conserving implicit kinetic algorithms greatly relax the spatial Debye length and temporal plasma frequency constraints allowing for larger simulations volumes and times. Including PIC hybrid techniques further accelerates the computational speed. These new capabilities allow for more accurate simulation of pulse-power accelerators, high power diodes, microwave sources, and gas switch performance. We will describe PIC methodologies for kinetic, multi-fluid and hybrid techniques for blending the various PIC descriptions into a single integrated simulation. Finally, practical examples of these techniques in stressing plasma physics environments will also be presented using the LSP and CHICAGO codes.

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Date submitted: 03 Jul 2019 Electronic form version 1.4